



Publication number: **0 586 323 A1**

**EUROPEAN PATENT APPLICATION**

Application number: **93500108.1**

Int. Cl.<sup>5</sup>: **C11D 1/74**

Date of filing: **20.07.93**

Priority: **20.07.92 EP 92500092**

Date of publication of application:  
**09.03.94 Bulletin 94/10**

Designated Contracting States:  
**AT BE DE ES FR GB IT NL**

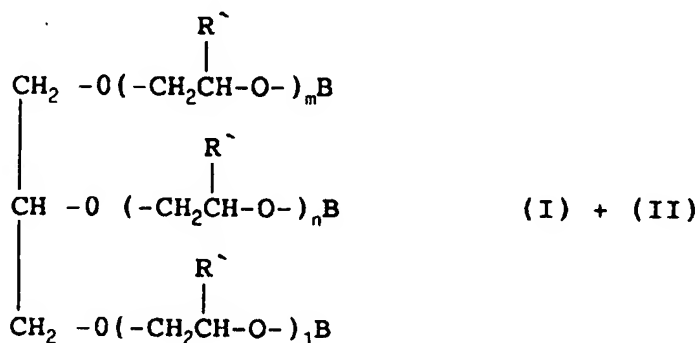
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**Detergent composition and method for its preparation.**

Detergent composition comprising the compounds represented by the formula (I) + (II) wherein the weight ratio of mono, di and tri-ester is 46-90/9-30/1-15,



wherein:

- "B" represents "H" or the group represented by



provided that R represents alkyl or alk nyl group having C<sub>6-22</sub>. R' represents H or CH<sub>3</sub>, and each of n, m and 1 independently represents an integer from 0 to 40; being m+n+1=2-100 preferably 9-19.

The new detergent composition shows outstanding biodegradability, non-toxic, non-irritant performance, foam stability and better dye inhibition transfer maintaining and even improving detergency.

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*Exemp 10 and 20*

SPECIFICATION

## Field of the invention.

5 The present invention relates to novel liquid detergent compositions which are biodegradable, non-toxic, and non-irritant, while improves its detergency, foam stability and colour protection in case of heavy and light duty detergent. These detergent compositions are particularly useful to formulate shampoos, body shampoos, washing up, all purpose cleaners, heavy and light duty detergents.

In fact, the present invention relates to cleaning formulations comprising a specific nonionic compound.

10 In addition to that, the present invention relates to a method for preparing the above mentioned nonionic.

## Description of Prior Art.

15 Most of detergent compositions involve a combination of anionic, amphoteric and/or nonionic surfactants, in order to get better properties according to final product in terms of irritation, detergency and foam profile.

One of the current problems in the whole field of chemicals is the question of ecotoxicity and the duality cleanliness/damage, that is how to get a good performance without interact seriously with the surface (fabrics or skin).

20 The nonionics employed in the detergent compositions were conventionally ethoxylated nonylphenols, C<sub>12-18</sub> alcohols ethoxylated with approximately 12 moles of ethylene oxides, lately C<sub>12-15</sub> alcohols ethoxylated with 2 to 9 moles of ethylene oxides and EO/OP derivatives.

For instance:

Japanese Patent Laid-Open No. 55-86894, discloses the use of a secondary C<sub>8-14</sub> alcohols ethoxylated with 4-15 moles of ethylene oxides on average.

25 Japanese Patent Laid-Open No. 52-22007, and Japanese Patent Publication No. 83037356, disclose the use of middle alcohol ethoxylated of formula R<sub>1</sub>O(C<sub>2</sub>H<sub>4</sub>O)<sub>n</sub>H, wherein R<sub>1</sub> is straight chain or branched alkyl radicals and n is 1-12 on average in detergent compositions.

European Patent No. 80749, discloses the use of ethoxylated alkyl phenols in detergent compositions.

US Patent 4908150, discloses the use of polyethylene glycol ether of a glycerol ester compositions.

30 Japanese Patent Laid-Open No. 55-133495, discloses the use of a polyoxyethylene hardened castor oil or fatty acid ester, thereof, polyoxyethylene glyceryl ether fatty acid ester, polyoxyethylene trimethylol propane fatty acid ester and polyoxyethylene alkylether diester of N-lauroylglutamic acid etc, in detergent compositions.

However, use of such nonionics deteriorates detergency ability of detergent formulation. Also in case of heavy and light duty liquids detergents tends to cause dye transfer, especially upon repeated laundering. In addition to the above mentioned points, current nonionics cause skin and eye irritation, and values of fish toxicity, daphnia immobilization and algae are not acceptable under the present environmental requirements.

35 Others patents describes the use of specific non-ionic compounds, different from the usual ones, in particular applications and/or conditions.

US Patent 4247425, discloses the use of alkoxyated partial glycerol esters of a detergent grade fatty acid in light duty detergent compositions.

EP Patent 0007120, discloses an emulsifying system, to be used in a handwashing composition, mainly consisting of mono and diglycerides of higher natural fatty acids and ethoxylated glycerine esterified by fatty acids.

45 US Patent 4897214, discloses the use of monoesters of fatty acids with polyoxyethylene hexitan derivatives in skin cleaning preparations.

WO Patent 92/00945, discloses the use of octadienyl glycerin ethers with polyoxyethylene.

UK Patent 2197338, discloses the use of polyoxyalkylene alkyl- or alkenyl ethers and polyoxyalkylene glycerol fatty acid esters in detergent compositions.

50 In none of disclosures mentioned above it is taught a nonionic like the one described in the present invention.

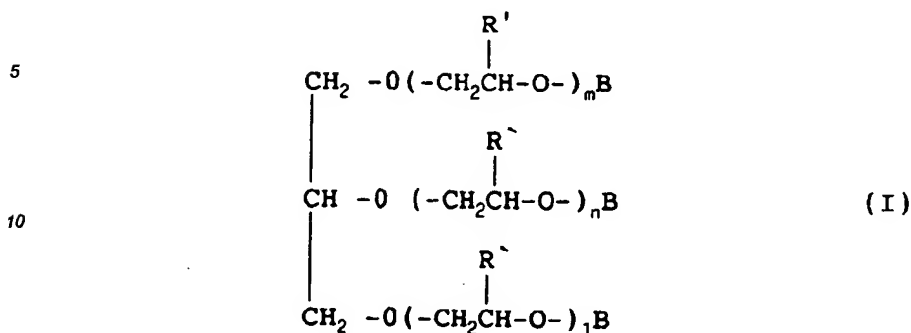
The present inventors have carried out research on the development of a detergent composition, which will exhibit the outstanding biodegradable, non-toxic, non-irritant performance, foam stability and better dye inhibition transfer maintaining and even improving detergency.

It was unexpectedly found that the above mentioned requirements can be met when the specified nonionic compound is incorporated into detergent composition.

This finding has led to the present invention.

Accordingly, the present invention relates to a detergent compositions comprising the compound repre-

sented by the formula (I), where the mono/di/tri-ester proportion is 46-90/9-30/1-15



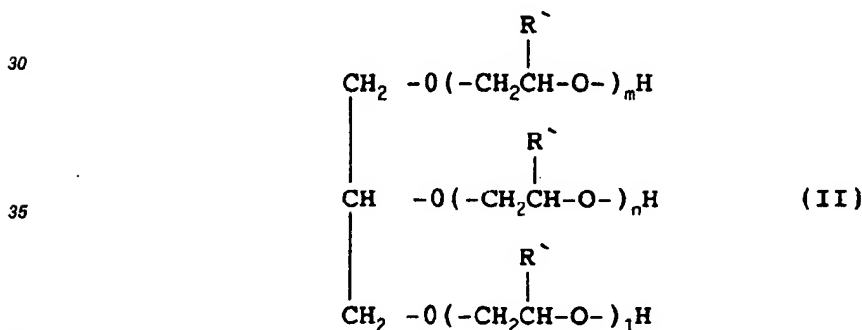
wherein:

- "B" represents "H" or the group represented by



provided that R represents alkyl or alkenyl group having C<sub>6-22</sub>. Consider that at least one of "B" is an ester group.

- "n", "m" and "1" may have a value between 0 and 40 provided that (n+m+1) = 2 - 100 preferably 9 - 19.
- R' represents H or CH<sub>3</sub> respectively and the compound represented by the formula (II)



wherein:

- "n", "m" and "1" may have a value between 0 and 40 provided that (n+m+1) = 2 - 100 preferably 9 - 19.
- R' represents H or CH<sub>3</sub> respectively.

Being the high content of ethoxylated monoester in compound (I) and ratio (I)/(II) the key parameters to get the above mentioned properties.

Ratio (I)/(II) may have a value between 3 to 0,33 preferably 1,3 to 0,75.

The compound mixture of the formula (I) + (II) in the present invention can be obtained by conventional method for preparing it.

For example the compound can be obtained by following the reaction processes.

(A) The interesterification reaction between triglyceride and glycerine, in a molar ratio in the proportion of 0.1-10/1, preferably 0.15-3.5 (in presence of alkaline catalyst), and the reaction with alkylene oxide C<sub>2-3</sub> or viceversa will lead to a mono- di- and triglyceride mixture (I) and (I)/(II) ratio of specific composition and structure, due to migration and exchange phenomena, with an HLB higher than 2.

(B) The reaction of glycerine with alkylene oxide C<sub>2-3</sub>, in presence of alkaline catalysts and the later reaction with fatty acid in a molar ratio in the proportion of 0.1-10/1, preferably 0,7-3,5/1 in presence of acidic or alkaline catalysts will lead to a mono- di- and triglyceride mixture of a specific composition and structure, due to migration and exchange phenomena, with an HLB higher than 2.

Triglyceride which can be used in process (A) includes natural fat and oil as well as a synthetic triglyceride.

The fat and oil include vegetable oil such as coconut oil, palm oil, soybean oil; and animal fat and oil such as beef tallow, bone oil; aquatic animal fat and oil; hardened oils and semihardened oil thereof.

In the present invention the compound of the formula (I)+(II) can be incorporated in an amount of from 0.2% to 40%, preferably from 3% to 20% by weight based on the whole of the detergent composition.

The reason why the present invention exhibits the outstanding biodegradable, non-toxic and non-irritant performance without deteriorating its detergency is not certain, but it seems to applicant that good performance of the present composition comes partially from the fact that existence of fatty acid groups facilitates its biodegradability and its very low skin irritation, oral toxicity, fish toxicity, algae and daphnia immobilization compared with conventional nonionics.

Furthermore incorporation of the formula of the new nonionic described in the patent, considerably improves its foam profile, anti dye transfer and perfume solubilization properties compared with conventional formulations, due to EO monoglyceride high ratio and the synergistic effect between (I) and (II).

The surface active agents like anionic, other nonionic, amphoteric etc and the rest of additive useful in the practice of this invention depends a great deal on kind of final product to be formulated. At the same time they are standard items of commerce so they will be not further comments upon herein.

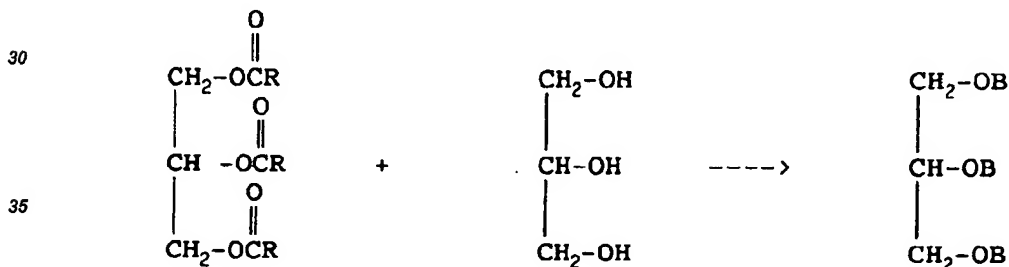
#### Example

The present invention is described in detail by way of the following examples. The present invention, however, is not limited to these examples.

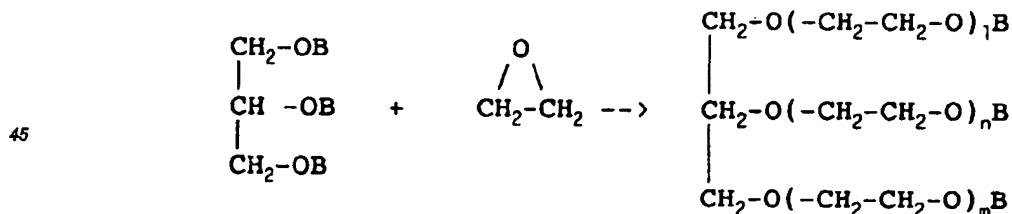
#### REFERENTIAL EXAMPLE 1.

The compound (I)+(II) is obtained, for instance by means of the following process:

#### Step (c).



#### Step (d).



(I)+(II)

(See previous pages)

wherein:

- "B" represents "H" or the group represented by



$l + m + n = 20$

5

and  $l+m+n = 15$ .

- "R" represents a coco alkyl chain.

- (I)/(II) ratio is 1.

500 g (0.76 moles) of coco TRG, 210.7 g (2.29 moles) of glycerine 99% and 1.2 g of KOH 85% as catalyst are placed in a 3 kg flask properly equipped. System is purged several times with  $\text{N}_2$ , vacuum stripping till 110°C, and continued heating to 140°C. When temperature reaches 140°C the reactor is pressurized to 2-3 kg/cm<sup>2</sup> with ethylene oxide added until a total of 2013 gr (45.7 moles).

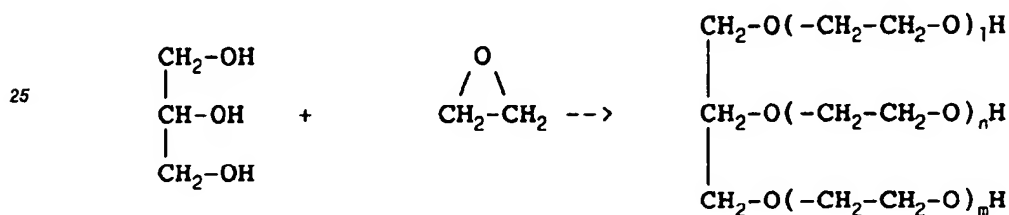
After the final charge of ethylene oxide the reaction mixture is allowed to react for about 1/2 hour; cooled and discharged from reactor. A product like ( I ) + ( II ) is obtained.

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#### REFERENTIAL EXAMPLE 2.

The compound ( I ) + ( II ) is obtained, for instance by means of the following process:

20 Step (e).



30

Step (f).



40

( I ) + ( II )

(See previous pages)

wherein:

45 "B" represents "H" or the group represented by



50

and  $l+m+n = 10$ .

R' represents  $\text{CH}_3$ .

R means tallow alkyl chain.

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Ratio (I)/(II) = 1.3

14.3 g (0.1554 mol s) of glycerin 99% and 1.2 g of KOH 85% as catalyst are placed in a 250 gr flask properly quipped. System is purged s veral times with  $\text{N}_2$ , vacuum stripping till 110°C, and continued heating to 140°C. When temp ratur r ach s 140°C the reactor is pressurized to 2-3 kg/cm<sup>2</sup> with ethylene oxide added

$l + m + n = 10$

until a total of 67,9 gr (1.54 moles). After the final charge of ethylene oxide, the reaction mixture is allowed to react for about 1/2 hour; 52.3 gr (0.15 mol) of a methyl ester of fatty acid derived from tallow, is added and mixed for 45 minutes. Finally product is cooled and discharged from reactor. Thus a compound (I) + (II) is obtained.

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## EXAMPLE 1.

## HDPD

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## COMPOSITION

Raw materials	1	2	3	4	5	6
Na dodecyl benzene sulphonate	10	10	10	10	10	10
Ethoxylated (7) C <sub>13-15</sub> alcohol	9	--	6	--	9	--
Nonionic of present invention. (from refe- rential example 2)	--	9	--	6	--	9
Coco fatty acid	--	--	2	2	--	--
Silicone	0.2	0.2	0.1	0.1	0.2	0.2
Zeolite	35	35	--	--	35	35
STPP	--	--	35	35	--	--
Polycarboxilated	5	5	5	5	5	5
CMC	1.5	1.5	1.5	1.5	1.5	1.5
Perborate mono						

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	hydrate	15	15	13	13	15	15
	Na Carbonate	12	12	15	15	12	12
5	Na Silicate	2	2	2	2	2	2
	PVP	--	--	--	--	0.8	0.6
	Enzyme	0.7	0.7	0.7	0.7	0.7	0.7
	TAED	4	4	4	4	4	4
10	Sodium sulphate	B.	B.	B.	B.	B.	B.
	Perfume	1	1	1	1	1	1

15 Note: B means balance.

Detergency evaluation test:

Washing machine:

20 Temperature: 30°C and 60°C.

Dosage: 6 gr/l.

Water hardness: 20°HF and 40°HF.

25 Washing load: 2kg of not soiled cotton-polyester cloth  
and EMPA 101,104,117 + particulated soil.

No pre-washing program.

Detergent ability was evaluated on detergent compositions appearing in table 1.

30 All variables considered, that is, temperature, water hardness and soil type the nonionic described in this patent shows in the worst of cases equivalent efficiency in terms of detergency.

However, on the other hand, compositions containing the nonionic of the present invention provide a more superior colour care than usual ethoxylated alcohol.

The following test have been conducted at 30°C.

35

1.- Using Reactive dyestuff.

After 15 washings, differences appeared in terms of colour transfer.

40 Dye transfer was evaluated measuring delta E values  $(L^2 + a^2 + b^2)^{1/2}$  by Hunter-Lab. The resulting discoloration of fabrics is shown in table below:

Table 1.

Compositions	Blue	Green	Red
1	8.0	14.0	6.0
2	5.7	10.3	5.0
3	6.0	8.0	4.5
4	5.0	6.5	4.0
5	1.3	0.9	0.5
6	1.2	1.0	0.5

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The lower delta E, the better composition is able to prevent dye transfer. Therefore can be concluded from the above results that the nonionic from the present invention performs better than alcohol ethoxylated preventing dye transfer. In addition to that it is possible to save some amount of polyvinylpyrrolidone (typical dye-

transfer inhibitor). The specific amount to be saved will depend on the effect of other components, that means, on formulation design. It seems to the applicant that a synergistic effect exists between the nonionic of present invention and PVP.

5 2.- Using Direct dyestuff.

References:

Yellow: Solar Yellow 3LG 160%

Blue: Solar Blue 2GLN 350%

10

Formulations:	Blue	Green	Yellow
Solar Blue 2GLN 350%	1%	1%	--
Solar Yellow 3LG 160%	--	1%	1%
SO <sub>4</sub> Na <sub>2</sub>	20 g/l	20 g/l	20 g/l
Sandofix R	3%	3%	3%

15

20

After 3 washings, differences appeared in terms of colour transfer.

Dye transfer was evaluated measuring delta E values  $(L^2 + a^2 + b^2)^{1/2}$  by Hunter-Lab. The resulting discoloration of fabrics is shown in table below:

Table 2.

25

Compositions	Blue	Green	Yellow
1	2.0	2.5	4.0
2	1.3	1.7	3.0
3	1.6	8.0	3.2
4	0.9	6.5	2.0
5	1.3	0.9	0.7
6	1.2	1.0	0.7

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Those results, test 1 and 2, were corroborated using a 5 people panel, who evaluate the results according to a scale.

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## EXAMPLE 2.

## HDL

	COMPOSITIONS			
	1	2	3	4
Raw materials				
Na lauryl sulphate	--	--	4	4
Na dodecyl benzene sulphonate	10	10	5	5
Ethoxylated (7) C <sub>13-15</sub> alcohol.	--	5	--	15
Nonionic of present invention. (from refe- rential example 2)	5	--	15	--
Potassium coconut soap	5	5	10	10
Ethanol	--	--	3	3
Propylenglycol	7	7	7	7
Perfum	1	1	1	1
Enzyme	0.7	0.7	0.5	0.5
Na formiate	1	1	1	1
Na phosphonate	0.8	0.8	0.8	0.8
TEA 85%	Req.	Req.	Req.	Req.
NaOH 50%	Req.	Req.	Req.	Req.
Cl <sub>2</sub> Ca 1%	2	2	2	2
Water	B.	B.	B.	B.

Note: B means balance.  
Req. means required amount.

Following the same test conditions than explained above for HDPD, (adapting the dosage according to the composition) the following results were obtained:

- Good enough detergency in all cases.
- Colour appearance results are shown in table 3.

Table 3.

Compositions	Blue	Green	Red
1	0.9	4.0	3.2
2	1.5	5.0	3.8
3	1.6	5.1	3.8
4	3.0	6.0	4.5

In short, compositions containing the nonionic of the present invention prevent better the colour transfer even in HDL where the pH is neutral and no optical brighteners are used. (Note that HDL were used as colour saving detergents before appearing the new segment of colour saving H.D.P.D..)

## EXAMPLE 3.

WASHING UP.				
	COMPOSITIONS			
Raw materials	1	2	3	4
Na lauryl ether sulphate	10	10	7	7
Na Alfa-olephine sulphonate	--	--	4	4
Alkyl amido propyl betaine	5.3	4.5	5.7	2.5
Ethoxylated (7) C <sub>13-15</sub> alcohol	13	--	--	--
Nonionic of present invention. (from referential example 1)	--	7	--	7
Coconut diethanol amide	5	--	--	--
Amine oxide	--	--	3.3	--
Perfume	1	1	1	1
Water	bal.	bal.	bal.	bal.

Table 4.

Composition	1	2	3	4
Nº of dishes:	28	33	29	34
Fat dispersion (*)	R	QG	G	VG

(\*) Key: R regular; QG quite good; G good enough;

VG Very good.

Compositions containing Levenol shows a better detergency and fat dispersion, allowing the supresion of nitrogen derivatives (alkanol amide and amine oxide) and also the complete substitution of ethoxylated alcohol. Other key point is the partial substitution of betaine. The nonionic of the present invention gives also a creamy foam compared to other compositions.

In order to check the effect on the skin of the nonionic of the present invention, a primary skin irritation test was conducted:

## EXAMPLE 4.

	COMPOSITION	IRRITATION INDEX
1.-	Sodium lauryl sulphate 6.25% .....	1.88
2.-	Sodium lauryl sulphate 4.25%	
	+ Nonionic (1) 2.00% .....	1.00
3.-	Sodium lauryl sulphate 4.25% .....	1.38

## EXAMPLE 5.

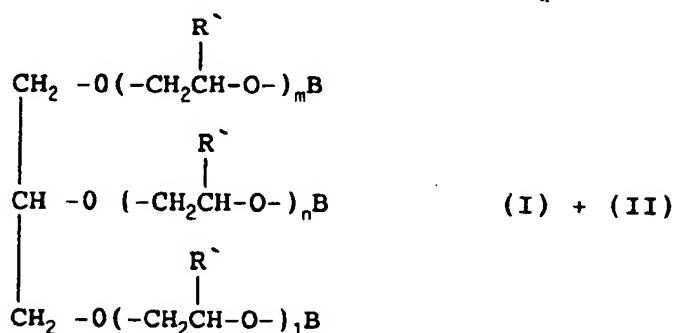
	COMPOSITION	IRRITATION INDEX
5	1.- Sodium lauryl sulphate 4.25%	
	+ Coco imidazoline betaine 2.00% .....	1.08
10	2.- Sodium lauryl sulphate 4.25%	
	+ Alkylamide propyl betaine 2.00% .....	0.96
15	3.- Sodium lauryl sulphate 4.25%	
	+ Nonionic (1) 2.00% .....	1.00
20		

(1) Represents nonionic of the present invention from the referential example 2.

From the comparison of the above compositions, can be inferred the mild effect of the nonionic of the present invention.

## Claims

1. Detergent composition comprising the compounds represented by the formula (I) + (II) wherein the weight ratio of mono, di and tri-ester is 46-90/9-30/1-15,



Wherein:

- "B" represents "H" or the group represented by



provided that R represents alkyl or alkenyl group having C<sub>8-22</sub>, R' represents H or CH<sub>3</sub>, and each of n, m and l independently represents an integer from 0 to 40; being m+n+l=2-100 preferably 9-19.

2. Detergent composition according to claim 1 in which the ratio (I)/(II) has a value between 3 to 0,33 preferably 1,3 to 0,75.
3. Method for the preparation of a detergent composition, wherein the compounds represented by the general formula (I) + (II) are produced by the following steps (a) and (b):
  - a) The mixture of triglyceride, and glycerine is subjected to a inter-esterification reaction,
  - b) The reaction mixture obtained in the step (a) is subjected to alkoxylation using alkylene oxide having C<sub>2-3</sub> in the presence of alkaline catalyst to produce the compounds represented by the general formula (I) + (II).
4. Method for the preparation of a detergent composition, wherein the compounds represented by the general formula (I) + (II) are produced by the following steps (c) and (d):
  - c) The mixture of glycerine and alkylene oxide C<sub>2-3</sub>, in presence of alkaline catalysts,
  - d) The reaction mixture obtained in the step (c) reacted with methyl ester of fatty acid or fatty acid.



European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number  
EP 93 50 0108

DOCUMENTS CONSIDERED TO BE RELEVANT				
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)	
A	FR-A-2 390 498 (ASHLAND OIL INC.) * page 2, line 29 - page 3, line 33; claim 1 *	1,4	C11D1/74	
D,A	GB-A-2 197 338 (KAO CORP.) * claims 1,5,11 *	1		
D,A	US-A-4 897 214 (G. GAZZANI) * column 3, line 1 - line 21; claims *	1		
D,A	DATABASE WPI Section Ch, Derwent Publications Ltd., London, GB; Class A97, AN 80-85324C [48] & JP-A-55 133 495 (LION FAT & OIL K K) * abstract *	1		
A	PATENT ABSTRACTS OF JAPAN vol. 013, no. 388 (C-630)1989 & JP-A-11 035 714 (LION CORP.) 29 May 1989 * abstract *	1		
A	CHEMICAL ABSTRACTS, vol. 100, no. 24, 11 June 1984, Columbus, Ohio, US; abstract no. 194041r, page 121 ; * abstract * & JP-A-5 901 600 (NIHON EMARUJON K K) 6 January 1984	1		C11D
D,A	EP-A-0 007 120 (CHEMISCH ADVIESBUREAU) * claims 1,4,6 *	1		
D,A	WO-A-92 00945 (HENKEL KGAA.) * page 4, paragraph 2; claims *	1		
-/--				
The present search report has been drawn up for all claims				
Place of search THE HAGUE		Date of completion of the search 4 November 1993	Examiner SERBETSOGLU, A	
<p><b>CATEGORY OF CITED DOCUMENTS</b></p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons * : member of the same patent family, corresponding document</p>				

EPO FORM 1500 (12.92) (P.O. 001)

## EUROPEAN SEARCH REPORT

Application Number  
EP 93 50 0108

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. CL.5)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
D, A	US-A-4 343 726 (R.R. EGAN ET AL.) * column 3, line 19 - column 4, line 56; claims 1-34 *	1	TECHNICAL FIELDS SEARCHED (Int. CL.5)
D, A	& US-A-4 247 425 -----		
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
THE HAGUE	4 November 1993	SERBETSOGLU, A	
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			